

WHAT IS CLAIMED IS:

1. A method of post processing an article formed by solid freeform fabrication to remove a support structure, the article comprising a three-dimensional object and the support structure, the three-dimensional object and the support structure comprising at least one phase change component, the method comprising the steps of:

- (a) providing a temperature controllable environment for the article;
- (b) placing the article in the temperature controllable environment at a temperature that causes the support structure to transition to a flowable state;
- (c) removing substantially all of the support structure in the flowable state from the article;
- (d) changing the temperature of the controllable environment to a temperature just above the freezing point of the phase change component;
- (e) holding the temperature of the controllable environment just above the freezing point of the phase change component until the temperature of all the regions of the three-dimensional object substantially equalize; and
- (f) lowering the temperature of the three-dimensional object below the freezing point of the phase change component.

2. The method of claim 1 wherein the step of removing substantially all of the support structure is accomplished by holding the temperature of the temperature controllable environment above the melting point of the phase change component until substantially all of the support structure transitions to a flowable state and is removed from the three-dimensional object.

3. The method of claim 2 further comprising the step of, after substantially all of the support structure is removed, lowering the temperature of the temperature

controllable environment below the freezing point of the phase change component so
that the remaining support structure in contact with the three-dimensional object
5 transitions to a non-flowable state.

4. The method of claim 1 further comprising the step of;
providing at least one heat transferring fluid medium in the temperature
controllable environment.

5. The method of claim 4 wherein the fluid medium is selected from the
group consisting of an aqueous solution, an oil-based solution, and an oil-based fluid.

6. The method of claim 4 wherein the phase change component is soluble in
the fluid medium.

7. The method of claim 4 wherein the phase change component is
immiscible in the fluid medium.

8. The method of claim 4 wherein the fluid medium is an aqueous solution
including a surfactant establishing an emulsion the polymer material in the flowable
state.

9. The method of claim 4 further comprising the step of:
providing agitation to the three-dimensional object via the fluid medium.

10. The method of claim 9 wherein the agitation is provided by ultrasonic
stimulation.

11. The method of claim 4 wherein the heat transferring fluid medium used in step (c) is air.

12. The method of claim 6 wherein the heat transferring fluid medium used in steps (d), (e), and (f) is selected from the group consisting of an aqueous solution, an oil-based solution, and an oil-based fluid.

13. The method of claim 1 wherein the step of changing the temperature of the temperature controllable environment to just above the freezing point of the phase change component is a temperature of between about 60°C to about 65°C.

14. The method of claim 1 wherein the step of holding the temperature of the controllable environment just above the freezing point is accomplished for a time period of at least about 20 minutes.

15. The method of claim 1 wherein the phase change component is a wax material having a freezing point of between about 50°C to about 60°C and a melting point of between about 45°C to about 55°C.

16. A method of post processing an article formed by solid freeform fabrication to remove a support structure, the article comprising a three-dimensional object and the support structure, the three-dimensional object and the support structure comprising at least one phase change component, the method comprising the following steps:

- (a) providing a temperature controllable environment for the article;
- (b) placing the article in the temperature controllable environment at a temperature that causes the support structure to transition to a flowable state;
- (c) removing substantially all of the support structure in the flowable state

from the article;

10 (d) submersing the article in a fluid medium in the temperature controllable environment at a temperature above the melting point of the phase change component, the phase change component being at least partially soluble in the fluid medium; and

(e) lowering the temperature of the three-dimensional object in the fluid
15 medium below the freezing point of the phase change component.

17. The method of claim 16 wherein the article is submersed in the fluid medium prior to removing substantially all of the support structure in the flowable state from the article.

18. The method of claim 16 wherein the step of removing substantially all of the support structure is accomplished by holding the temperature of the controllable environment above the melting point of the phase change component until substantially all of the support structure transitions to a flowable state and is removed from the three-
5 dimensional object.

19. The method of claim 18 further comprising the step of, after substantially all of the support structure is removed, lowering the temperature of the temperature controllable environment below the freezing point of the phase change component so that the remaining support structure in contact with the three-dimensional object
5 transitions to a non-flowable state.

20. The method of claim 16 further comprising the step of providing agitation to the three-dimensional object via the fluid medium.

21. The method of claim 20 wherein the agitation is provided by ultrasonic stimulation.

22. The method of claim 16 wherein the fluid medium is selected from the group consisting of an oil-based solution or an oil-based fluid.

23. The method of claim 22 wherein the fluid medium comprises fatty acid esters.

24. The method of claim 23 wherein the fatty acid esters are derived from organic oils selected from the group consisting of linseed oil, soybean oil, castor oil, sunflower seed oil, tall oil, tung oil, and combinations thereof .

25. The method of claim 16 wherein air is used as a heat transferring medium in step (c).

26. The method of claim 16 wherein the temperature of the temperature controllable environment in step (c) is a temperature greater than about 60°C.

27. The method of claim 16 further comprising the steps of:
removing the fluid medium from the temperature controllable environment;
rinsing the three-dimensional object in an aqueous solution to remove any residual fluid medium the three-dimensional object; and
drying the article.